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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/565,773	08/17/2006	Otto Erik Sietcken	4662-135	3000
23117 7590 04/28/2009 NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203				
EXAMINER				
CUTLIFF, YATE KAI RENE				
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1621				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/565,773

Applicant(s)

SIELCKEN ET AL.

Examiner

YATE' K. CUTLIFF

Art Unit

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 11-15 and 17-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-15 and 17-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of Claims

1. Claims 1 – 9, 11 - 15, and 17-21 are pending.

Claims 10 and 16 have been canceled

Claims 1 – 9, 11 - 15, and 17-21 are rejected.

Response to Amendment

2. The amendment to claims 1, 9, 15 and 17, submitted January 14, 2009 is acknowledged and entered.

Response to Arguments

3. Applicant's arguments, see pages 7 - 10, filed January 14, 2009, with respect to the rejection(s) of claim(s) 1 – 9, 11-15 and 17 - 21 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn in view of the amendment and arguments. However, upon further consideration, a new ground(s) of rejection is made in view of Drent et al. (US 6,737,542) (Drent 3), Drent et al. (WO 02/26690 A1) (Drent 1), as set out below.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant(s) regard as their invention. Evidence that claim 1 fail(s) to correspond in scope with that which applicant(s) regard as the invention can be found in the reply filed January 14, 2009, page 9. In that paper, applicant has stated the

claimed process only produced mono-carboxylated compounds, and this statement indicates that the invention is different from what is defined in the claim(s) because the claims are to the process for the carbonylation of a conjugated diene which can produce a mono-carboxylated compound or diester.

6. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claim 20 recites the limitation "'the carboxylic acid..." in lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1 – 9, 11 - 15, and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drent et al. (US 6,737,542) (Drent 3) in view of Drent et al. (WO 02/26690 A1) (Drent 1).

12. The rejected claims cover, inter alia, a process for the carbonylation of a conjugated diene comprising: reacting a conjugated diene with carbon monoxide and a hydroxyl group-containing compound in the presence of a palladium catalyst system in a reaction zone to produce a reaction mixture, said catalyst system comprising (a) a source of palladium cations, (b) a mono-, bi- or multidentate phosphine process ligand (b) containing at least one phosphorus atom which is directly bound to two or three aliphatic carbon atoms to produce a palladium-phosphine ligand complex catalyst, and (c) a source of anions; wherein the process ligand (b) is fed continuously or periodically into the process as ligand make-up at a temperature of 50°C or lower, and wherein the process further comprises feeding a second phosphine ligand different from the process ligand (b) continuously or periodically to the process as ligand make-up, wherein said second ligand is chosen such that its phosphonium salt is reversible under carbonylation conditions. Process ligand (b) is defined in claim 1.

The dependent claims further modify the process steps; limit the second phosphine ligand; and identify the reactants as specific conjugate diene, hydroxy groups and carboxylic acids.

13. Drent 3 teaches at column 1, lines 49 – 65 the following process.

The present invention therefore provides a process for the carbonylation of conjugated dienes, whereby a conjugated diene is reacted with carbon monoxide and a hydroxyl group containing compound in the presence of a catalyst system based on:

- (a) a source of palladium cations,
- (b) a phosphorus-containing ligand
- (c) a source of anions,

wherein the phosphorus-containing ligand is a ligand having the general formula I



wherein X^1 and X^2 represent a substituted or non-substituted cyclic group with at least 5 ring atoms, of which one is a phosphorus atom, and R represents a bivalent organic bridging group, connecting both phosphorus atoms, containing from 1 to 4 atoms in the bridge.

The process prepares alkyl pentenoates and/or adipates from 1,3-butadiene. (see column 1, lines 9-10). The sources of hydroxyl are alkanols with 1-20 carbon atoms, where suitable alkanols are methanol and ethanol. (see column 2, lines 41-51). Suitable sources of phosphorous-containing ligands are formula (I) substituted or non-substituted and mixtures thereof, as set out in column 4, lines 34-43. Additionally, suitable substituents for the phosphabicyclononyl rings (X^1 and X^2) are set out in column 4, lines 1-27. The source of anions for step (c) are carboxylic acids i.e.

pentenoic acid. (see column 5, lines 13 & line 59). Solvents useful in the process include diethyleneglycol. (see column 7, lines 23-25). The reaction temperature ranges from 20 to 200°C. (see column 7, lines 27 – 28). Further, the process can be continuous. (see column 6, lines 57 – 58). Lastly, the process is selective for either mono-ester or diester; and can be partially regulated by the source of anions used and regulated by the residence time in the reaction vessel. (see column 5, lines 53-54 & 63-67).

The difference between the claimed process and Drent 3 is as follows: a second phosphine ligand different from process ligand (b); the phosphonium salt of the second ligand is reversible under carbonylation conditions; the process ligand (b) and second phosphine ligand as ligand make-up; separation of the reaction product from the reaction mixture to obtain the catalyst mixture and recycling the catalyst mixture; monitoring the concentration and degradation rate; and the second phosphine ligand has less coordination strength to palladium.

14. With regard to the second phosphine ligand, Drent 3 does not specifically reference the use of a second ligand different from the processing ligand, however, it teaches that their process can include a ligand mixture. This suggests that any two of the ligands set out in column 4 could be used in the process of Drent 3. Applicant's selection of the second phosphine ligand is arbitrary and does not preclude the second phosphine ligand from being one of the listed process ligand (b).

It would have been obvious to one of ordinary skill in the art to include the second phosphine ligand in the process of Drent 3, since Drent 3 suggest the use of a

mixture of ligands in a process for the carbonylation of a 1,3-butadiene, where it is clear that mixture refers to the use of two or more of the suitable phosphorous ligands disclosed. Motivation for using a second phosphine ligand is disclosed in Drent 3 in his teaching that a mixture of ligands can be used in the process.

Therefore, the invention as a whole was *prima facie* obvious because a person of ordinary skill in the art at the time the invention was made, would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success.

15. With regard to the phosphonium salt of the second phosphine ligand being reversible under carbonylation conditions, the disclosed process ligands (b) as set out in claim 1 include "bis(9-phosphabicyclononyl)alkane" groups. These groups are also taught by Drent 1 and according to the Applicant's admission certain members of this group, in a carbonylation process, results in phosphonium salts that are not reversible to the starting materials and decompose. This admission implies that reversibility of the phosphonium salts formed from "bis(9-phosphabicyclononyl)alkane" is an inherent feature of that group under carbonylation conditions. A statement by an applicant in the specification or made during prosecution identifying the work of another as "prior art" is an admission which can be relied upon for both anticipation and obviousness determinations, regardless of whether the admitted prior art would otherwise qualify as prior art under the statutory categories of 35 U.S.C. 102. (*Riverwood Int'l Corp. v. R.A. Jones & Co.*, 324 F.3d 1346, 1354, 66 USPQ2d 1331, 1337 (Fed. Cir. 2003); *Constant v. Advanced Micro-Devices Inc.*, 848 F.2d 1560, 1570, 7 USPQ2d 1057, 1063 (Fed. Cir.

1988)). However, even if labeled as "prior art," the work of the same inventive entity may not be considered prior art against the claims unless it falls under one of the statutory categories. (Id.; see also *Reading & Bates Construction Co. v. Baker Energy Resources Corp.*, 748 F.2d 645, 650, 223 USPQ 1168, 1172 (Fed. Cir. 1984) ("[W]here the inventor continues to improve upon his own work product, his foundational work product should not, without a statutory basis, be treated as prior art solely because he admits knowledge of his own work. It is common sense that an inventor, regardless of an admission, has knowledge of his own work."). In this instance Drent 1 is 103 (a) prior art.

It would have been obvious to one of ordinary skill in the art to include the second phosphine ligand in the process of Drent 3, since Drent 3 suggest the use of a mixture of ligands in a process for the carbonylation of a 1,3-butadiene, where it is clear that mixture refers to the use of two or more of the suitable phosphorous ligands disclosed. Further, based on Applicant's admission, it is known that the phosphonium salts of the phosphorous containing ligands of Drent 3 may have as an inherent feature the ability to be reversible under carbonylation conditions; since the ligand of Drent 3 overlap with the ligand of Drent 1. Motivation for using second phosphine ligand is disclosed in Drent 3, where the second phosphine ligands are in a class of ligands which by Applicant's admission are reversible, in his teaching that a mixture of ligands can be used in the process.

In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35 USC

103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common senses.

16. With regard to the use of the process ligand (b) and the second phosphine ligand as ligand make-up; and monitoring the concentration and degradation rate, Examiner turned to the teachings of Drent 1. Drent 1 teaches a carbonylation process where a slight molar excess of ligand to palladium is used because the ligand degradation is decreased or even no ligand degradation occurs. Further, Drent 1 monitors the concentration and degradation of the ligand during the course of the process and adds fresh ligand in order to remain in the preferred ranges of operation. (see page 14, liens 16 - 27). The process of Drent 1 produces alkyl pentenoates. (see page 17, Example 1).

It would have been obvious to one of ordinary skill in the art to modify the process of Drent 3, and add either of the suitable phosphorous containing ligands disclosed as fresh ligand (make-up ligand) as suggest by Drent 1; since the teachings of Drent 1 suggest that there is a certain amount of ligand degradation in the process for the carbonylation of conjugated diene. Further, it would have been within the purview of one skilled in the art to monitor the concentration and degradation rate of the process ligand in order to know when to add the fresh ligand for completion of the reaction process. Motivation for adding fresh ligand (make-up ligand) and monitoring the ligand

as suggested by Drent 1, is the desire to maintain the stability of the catalyst system. (i.e. prevent palladium precipitate, or over consumption of the ligand).

Therefore, the invention as a whole was *prima facie* obvious because a person of ordinary skill in the art at the time the invention was made, would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success.

17. With regard to the separation of the reaction product from the reaction mixture and recycling the reaction mixture with a portion of the catalyst mixture, Drent 3 discloses that liquid carbonylation product and/or surplus of a carbonylation reactant may serve as solvent during the reaction. (see column 7, lines 18 – 21). Drent 3 does not specifically state that the any remaining portion of the catalyst system is removed. Further from the teaching of Drent 1, fresh ligand is added in the reaction process because of ligand degradation. As such, in a continuous process, one skilled in the art would expect that a portion of the ligand would be in that portion of the liquid carbonylation product and/or surplus of the carbonylation reactant that was returned to the system as solvent during the reaction. It is well established that consideration of a reference is not limited to the preferred embodiment or working examples, but extends to the entire disclosure for what it fairly teaches, when viewed in light of the admitted knowledge in the art, to person of ordinary skill in the art. (in re Boe, 355 F.2d 961, 148 USPQ 507, 510 (CCPA 1966); In re Lamberti, 545 F.2d 747, 750, 192 USPQ 279, 280 (CCPA 1976); In re Fracalossi, 681 F.2d 792, 794), 215 USPQ 569, 570 (CCPA 1982); In re Kaslow, 707, F.2d 1366, 1374, 217 USPQ 1089, 1095 (Fed. Cir. 1983)).

18. With regard to the issue of the second phosphine ligand having less coordination strength, the Examiner is directed to the fact that the ligands of the claimed process are disclosed in Drent 3 and Drent 1; which teach that in the catalyst system there is coordination between the palladium and the ligand. As such, since there is an overlap of phosphorus containing ligands of the catalyst system of Drent 3 and Drent 1 with the claimed ligands, this limitation is deemed to be obvious absent a showing of unexpected results.

A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA) 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YATE' K. CUTLIFF whose telephone number is (571)272-9067. The examiner can normally be reached on M-TH 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel M. Sullivan can be reached on (571) 272 - 0779. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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